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# Status of Conservation of Agriculture Genetic Resource in Vietnam

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## Abstract

Located in tropical and subtropical areas of Southeast Asia, Vietnam has some of the most abundant agricultural biodiversity in the world. Nowadays, the agriculture genetic resource conservation system in Vietnam includes 18 key units that are implementing agriculture genetic resource (AGR) conservation with three main groups: animals, plants, and microorganisms. In addition, there are other organizations involved in this issue including veterans, women, plant breeders, and old peoples clubs, Departments of Agriculture and Rural Development, and farmers and farm-households.

AGR conservation includes five main activities in Vietnam:

- Inventory and collection of genetic materials;
- Long-term and safety maintenance of collected genetic materials (*in situ* and *ex situ*);
- Evaluation of collected genetic materials;
- Documentation of genetic materials; and
- Exchange of data information and genetic resources.

## Introduction

Conservation and maintenance of animal, plant, and microorganism genetic resources comprise genetic resource conservation in order to provide initial materials for science research, improve breeding fields, and ensure the maintenance of biodiversity and essential prime materials of biological resources for sustainable development of modern and future agriculture.

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In general, genetic resources and AGRs particularly play important roles in economic and social development programs in every country. Therefore, AGR management and conservation can provide favorable conditions for sustainable agriculture development.

With great diversity and abundant plant, animal, and microorganism genetic resources, Vietnam is recognized as one of the 15 countries with the most diverse and abundant genetic resources in the world. Therefore, the Vietnamese government has been investing funds for genetic resource conservation since 1987. After more than 20 years, AGR conservation tasks have achieved some goals of specializing in collecting and maintaining genetic resources.

## Documentation of AGR management in Vietnam

Conservation of AGRs is carried out by the Vietnamese government as stipulated in documents such as laws, ordinances, decrees, and decisions. The main documents include the following:

- *Law on Fisheries* dated 26 November 2003;
- *Law on Forest Protection and Development* dated 3 December 2004;
- *Ordinance on Plant Protection and Quarantin*e dated 25 July 2001;
- *Ordinance on Plant varieties* dated 24 March 2004;
- *Ordinance on Livestock breeds* dated 05 April 2004;
- Decree no. 07/CP dated 5 February 1996 by the government on the management of plant seeds;
- Decree no. 23/2006/ND-CP dated 3 March 2006 by the government on the implementation of the *Law on Forest Protection and Development*;
- Decree no. 14/CP dated 19 March 1996 by the government on the management of domestic animals;
- Decision no. 845/TTg dated 22 December 1995 by the Prime Minister ratifying the "Plan of Action to protect the biodiversity of Vietnam "; and
- Decision no. 2117/1997/QD-BKHCN&MT dated 30 December 1997 by the Minister of Science, Technology and Environment to issue the regulation on the management and preservation of plant, animal and microorganism gene sources.

The above documents set up a legal framework and favorable conditions to make genetic conservation activities into rules, and in fact, these activities have reduced the erosion of AGRs, promoted the collection and conservation of valuable genes, and concretely and realistically contributed to national programs on plant and animal breeding.

## AGR conservation system in Vietnam

**1. Crop production and plant protection sectors:**

- The Plant Genetic Resources Center: conservation of plant genetic resources.
- Soil and fertilizer Research Institute: conservation of microorganism genetic resources in crop production.
- Plant protection Institute: conservation of genetic resources in plant protection.
- Hevea Research Institute: conservation of hevea genetic resources.

**2. Forestry sector:**

- Forest Science Institute: conservation of forest plant genetic resources.
- National Parks: Ba Vi (Ha Tay Province), Bach Ma (Thua Thien Hue Province), Ben En (Thanh Hoa Province), Cat Tien (Dong Nai, Binh Phuoc, and Lam Dong Provinces), Cuc Phuong (Ninh Binh, Thanh Hoa, and Hoa Binh Provinces), Tam Đao (Vinh Phuc, Thai Nguyen, and Tuyen Quang Provinces), and Yokdon (Dak Lak Province): conservation of valuable plant and animal genetic resources in national parks.
- Forestry University: conservation of endemic and valuable forest plant genetic resources.

**3. Animal husbandry and animal health sectors:**

- Department of Animal Health: conservation of microorganism genetic resources involved in animal health.
- Bee Research and Development Center: conservation of bee genetic resources.
- Animal Husbandry Institute: conservation of animal genetic resources.

**4. Fisheries sector:**

- Research Institute for Aquaculture No I: conservation of freshwater fisheries genetic resources.
- Research Institute for Aquaculture No III: conservation of brackish-water and seawater fisheries genetic resources.

## Status of AGR conservation

In terms of plant genetic resources, there are 150 protein tree species, 130 fruit tree species, 100 oil tree species, 90 fiber tree species, more than 1000 wood tree species, 3850 plant species used for medicine, and several hundred cosmetic tree species.

There are more than 12,000 plant species in the forests, among which there are 7,000 species which belong to 1850 lines of 267 angiosperm families. About 2,300 forest tree species can used for food, medicine, animal feed, or materials for national economic wood purposes.

There are 275 species and subspecies of mammals, 1026 bird species and subspecies, 260 reptile species, 32 amphibian species, 500 freshwater fish species, about 2000 marine fish species, and tens of thousands of invertebrates.

Recently, conservation units have concentrated on investigating and collecting genetic resources in domestically and overseas by different methods. So, thousands of extant breeding populations were collected and genes were discovered.

### 1. Crop production and the plant protection sector

***a. Plant genetic resources:***

In general, plant genetic resource conservation tasks have been implemented including investigations, collections, maintenance, and characterization, while detection of valuable genes and use for breed selection have been limited.

- This is a key unit (The Plant Genetic Resources Center) with 19 net units. Up to 2007, they maintained about 20,000 accessions of various crops *ex situ* and *in situ*. This invaluable national property preserves valuable genetic materials.
- Nearly 150 accessions were utilized from 2001 to 2007.
- More than 15,000 accessions have been documented (morphology).

***b. Microorganism genetic resources:***

- In total, 664 microorganism strains belonging to 30 bacterial, fungal, Antinomyces, and yeast families are being maintained. The collected strains were preserved by traditional and modern methods (slant agar in cold conditions, below mineral oil, liquid nitrogen freezing, etc.) to maintain the characteristics of the strains.
- Software of genetic management has been set up to support data management and fast access to data.

- In total, 535 microorganism strains have been isolated, and selected from soils, roots, and medical waste samples in different areas. In total, 109 microorganism strains used for crop production were added to the collection.
- A total of 330 of 664 microorganism strains have been evaluated.
- In total, 120 microorganism strains are being used for research and utilization in agriculture production like bio-fertilizers, biological preparations for plant protection, and so on.

**2. Animal husbandry and animal health sectors**

- Animals: 33 breeds are investigated and inventoried; 48 breeds are conserved and maintained; 44 breeds are evaluated; 12 breeds are exploited and utilized; 58 breeds documented.
- Bees: Four breeds are investigated and inventoried, and five breeds are conserved and maintained, in which one breed is evaluated, and three breeds are exploited, and four breeds are utilized and documented.
- Animal health sector: During that time, many animal breeds have been redressed and developed, and numerous genetic materials have been conserved *ex situ*. 48 microorganism strains, including 32 bacterial strains and 16 viral strains have been conserved and maintained. All of them are periodically examined. These viruses and bacteria are supplied for vaccine control, manufacturing, teaching, and research.

**3. Forestry sector**

About 1800 forest organisms are being maintained and conserved *in situ* and *ex situ* on over more than 250 hectares. *Ex situ* conservation needs a large budget so that highly valuable trees are protected. About 1300 trees were exploited and utilized for growing conservation forests, and protecting forests and economic forests.

**4. Fisheries sector**

- Fisheries genetic resource conservation tasks were implemented in three ecosystems in Vietnam. 50 freshwater fish clones and species and ten highly valuable brackish-water and seawater fisheries species were also collected and implemented. Every year, new genes are added, while old genes are developed and exploited. These clones and species are maintained and conserved in ponds, tanks, cages, or laboratories.

- Genetic resources of 35 species were exploited and exchanged between areas of the country as well as overseas to diversify and increase abundances of cultivated fish. Recently, fisheries genetic resource conservation and maintenance have concentrated on *ex situ* methods.

## International cooperation sector

International cooperation on agriculture genetic resource conservation has been implemented very well in recent times. We have established cooperative relations with several countries, international organizations, and non-governmental organizations. Some international cooperative ventures that have been implemented include the following:

- Plants: cooperation with the International Plant Genetic Resources Institute (IPGRI), International Rice Research Institute (IRRI), Asia Vegetable Research and Development Center (AVDRC-The World Vegetable Center), International Center for Tropical Agriculture (CIAT), FAO, etc.
- Animals: cooperation with the FAO, Japan, Holland, etc.
- Microorganisms: cooperation with Australia, Laos, the FAO, etc.

## Constraints on agriculture genetic resource conservation tasks

- Budgets are limited so investment in building and improving genetic conservation units, buying equipment, and training human resources has not yet been satisfactory for diversifying and increasing agriculture genetic resource conservation in Vietnam.
- AGR conservation tasks have just concentrated on investigation, collecting, maintaining, and initial evaluations. Detailed evaluation and exploitation, and utilization have been limited.
- Organization networks are insufficient and incomplete, and have overlapping tasks. Germplasm identifying priorities is also recommended.

## Action directions of AGR conservation in the future

- Promoting evaluation and exploitation of AGRs that are maintained in genebanks and network units;
- Promoting investigations and inventories to supply, restore, and conserve valuable plant and animal breeds;
- Propagating information on necessary AGR conservation for everyone to understand that genetic resource conservation is related to sustainable agriculture development, food safety, and environment protection; and
- Developing international cooperation for exchange experience to approach and share genetic resource benefits.

## References

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